

10/529289

IN THE CLAIMS

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Please amend the claims as follows:

Claim 1 (Currently Amended): A positive electrode active material ~~for a lithium secondary battery~~, which comprises a lithium-cobalt composite oxide represented by the formula  $\text{Li}_p\text{Co}_x\text{M}_y\text{O}_z\text{F}_a$  (wherein M is a transition metal element other than Co or an alkaline earth metal element,  $0.9 \leq p \leq 1.1$ ,  $0.980 \leq x \leq 1.000$ ,  $0 \leq y \leq 0.02$ ,  $1.9 \leq z \leq 2.1$ ,  $x+y=1$  and  $0 \leq a \leq 0.02$ ) and comprising a mixture ~~containing~~ comprising substantially spherical first particles of lithium-cobalt composite oxide having such a sharp particle size distribution that the volume basis cumulative size D10 is at least 50% of the average particle size D50, and the volume basis cumulative size D90 is at most 150% of the average particle size D50, and second particles of lithium-cobalt composite oxide filling the space among the above lithium-cobalt composite oxide particles, in a mass ratio of first particles/first particles of from 1/2 to 9/1.

Claim 2 (Original): The positive electrode active material according to Claim 1, wherein in the formula, M is at least one member selected from the group consisting of Ti, Zr, Hf, V, Nb, Ta, Mn, Mg, Ca, Sr, Ba and Al.

Claim 3 (Currently Amended): The positive electrode active material according to Claim 1, ~~Claim 1 or 2~~, wherein the average particle size D50 is from 5 to 15  $\mu\text{m}$ , the specific surface area is from 0.3 to 0.7  $\text{m}^2/\text{g}$ , the half value width of the diffraction peak on (110) plane at  $2\theta=66.5 \pm 1^\circ$  is from 0.07 to 0.14° as measured by X-ray diffraction using  $\text{CuK}\alpha$  as a radiation source, and the press density is from 3.1 to 3.4  $\text{g}/\text{cm}^3$ .

Claim 4 (Currently Amended): The positive electrode active material according to Claim 1, ~~any one of Claims 1 to 3~~, wherein the first particles are large particles having an

average particle size D50 of from 7 to 20  $\mu\text{m}$ , and the second particles are small particles having an average particle size of from 10 to 30% of D50 of the first particles.

Claim 5 (Currently Amended): The positive electrode active material according to Claim 1, ~~any one of Claims 1 to 4~~, wherein the first particles have a press density of from 2.9 to 3.2  $\text{g/cm}^3$ , and the second particles have a press density of from 2.7 to 3.1  $\text{g/cm}^3$ .

Claim 6 (Currently Amended): A process for producing the positive electrode active material as claimed in Claim 1, ~~for a lithium secondary battery as defined in any one of Claims 1 to 3~~, which comprises firing, as a cobalt source, a mixture of substantially spherical large particle size cobalt hydroxide or tricobalt tetraoxide having such a sharp particle size distribution that the average particle size D50 is from 7 to 20  $\mu\text{m}$ , the average particle size D10 is at least 50% of the average particle size D50 and the average particle size D90 is at most 150% of the average particle size D50, and small particle size cobalt hydroxide or tricobalt tetraoxide having an average particle size D50 of from 10 to 30% of the average particle size D50 of the large particles, in a proportion of from 9:1 to 1:2 as the cobalt atomic ratio, at a temperature of from 700°C to 1050°C in an oxygen-comprising ~~oxygen-containing~~ atmosphere.

Claim 7 (Original): The production process according to Claim 6, wherein the large particle size cobalt hydroxide or tricobalt tetraoxide has a press density of from 1.7 to 3.0  $\text{g/cm}^3$ , and the small particle size cobalt hydroxide or tricobalt tetraoxide has a press density of from 1.7 to 3.0  $\text{g/cm}^3$ .

Claim 8 (Currently Amended): The production process according to Claim 6, ~~Claim 6 or 7~~, wherein each of the large particle size cobalt hydroxide or tricobalt tetraoxide and the small particle size cobalt hydroxide or tricobalt tetraoxide has a specific surface area of from 2 to 20 m<sup>2</sup>/g.

Claim 9 (Currently Amended): The production process according to Claim 6, ~~any one of Claims 6 to 8~~, wherein the large particle size or small particle size cobalt hydroxide has a half value width of the diffraction peak on (001) plane at  $2\theta=19\pm1^\circ$  of from 0.18 to 0.35° and a half value width of the diffraction peak on (101) plane at  $2\theta=38\pm1^\circ$  of from 0.15 to 0.35°, in an X-ray diffraction spectrum using CuK $\alpha$ -ray.

Claim 10 (Currently Amended): A process for producing the positive electrode active material as claimed in Claim 1, ~~for a lithium secondary battery as defined in any one of Claims 1 to 3~~, which comprises firing, as a cobalt source, a mixture of substantially spherical cobalt hydroxide or tricobalt tetraoxide having such a sharp particle size distribution that the average particle size D50 is from 7 to 20  $\mu\text{m}$ , the average particle size D10 is at least 50% of the average particle size D50, the average particle size D90 is at most 150% of the average particle size D50, and the average particle size of secondary particles formed by agglomeration of primary particles is from 8 to 20  $\mu\text{m}$ , and cobalt oxyhydroxide having an average particle size of secondary particles formed by agglomeration of primary particles of from 7 to 20  $\mu\text{m}$ , in a proportion of from 5:1 to 1:5 as the cobalt atomic ratio, at a temperature of from 700°C to 1050°C in an ~~oxygen-containing~~ oxygen-comprising atmosphere.

Claim 11 (Original): The production process according to Claim 10, wherein the cobalt oxyhydroxide has a half value width of the diffraction peak on (220) plane at  $2\theta=31\pm1^\circ$  of at least  $0.8^\circ$  and a half value width of the diffraction peak on (311) plane at  $2\theta=37\pm1^\circ$  of at least  $0.8^\circ$ , in an X-ray diffraction spectrum using CuK $\alpha$ -ray, and has a specific surface area of from 10 to 80 m<sup>2</sup>/g.

Claim 12 (Currently Amended): The production process according to Claim 10, ~~Claim 10 or 11~~, wherein as the cobalt hydroxide, substantially spherical cobalt hydroxide having a half value width of the diffraction peak on (001) plane at  $2\theta=19\pm1^\circ$  of at least  $0.15^\circ$  and a half value width of the diffraction peak on (101) plane at  $2\theta=38\pm1^\circ$  of at least  $0.15^\circ$ , in an X-ray diffraction spectrum using CuK $\alpha$ -ray, and having a specific surface area of from 2 to 30 m<sup>2</sup>/g, is used.

Claim 13 (Currently Amended): The production process according to Claim 10, ~~any one of Claims 10 to 12~~, wherein the tricobalt tetraoxide has a half value width of the diffraction peak on (220) plane at  $2\theta=31\pm1^\circ$  of at least  $0.08^\circ$  and a half value width of the diffraction peak on (311) plane at  $2\theta=37\pm1^\circ$  of at least  $0.10^\circ$ , in an X-ray diffraction spectrum using CuK $\alpha$ -ray, and has a specific surface area of from 2 to 10 m<sup>2</sup>/g.

Claim 14 (Currently Amended): The production process according to Claim 10, ~~any one of Claims 10 to 13~~, wherein the cobalt hydroxide or the tricobalt tetraoxide has a press density of from 1.2 to 2.5 g/cm<sup>3</sup>.

Claim 15 (Currently Amended): The production process according to Claim 10, ~~any one of Claims 10 to 14~~, wherein the lithium-cobalt composite oxide has a half value width of

the diffraction peak on (110) plane of from 0.07 to 0.14°, a specific surface area of from 0.3 to 0.7 m<sup>2</sup>/g, a heat generation starting temperature of at least 160°C, and a press density of from 3.1 to 3.4 g/cm<sup>3</sup>.

Claim 16 (Currently Amended): A positive electrode ~~for a lithium secondary battery,~~  
which ~~contains~~ comprises the positive electrode active material as claimed in Claim 1.  
~~defined in any one of Claims 1 to 5.~~

Claim 17 (Currently Amended): A positive electrode ~~for a lithium secondary battery,~~  
which ~~contains~~ comprises a positive electrode active material obtained by the production  
process as claimed in Claim 6. ~~defined in any one of Claims 6 to 15.~~

Claim 18 (Currently Amended): A lithium secondary battery ~~employing~~ comprising  
the positive electrode active material as claimed in Claim 16. ~~defined in Claim 16 or 17.~~

Claim 19 (New): A positive electrode which comprises a positive electrode active  
material obtained by the production process as claimed in Claim 10.

Claim 20 (New): A lithium secondary battery comprising the positive electrode  
active material as claimed in Claim 17.

Claim 21 (New): A lithium secondary battery comprising the positive electrode  
active material as claimed in Claim 19.